

# Global Warming, it's Not the Problem, it's a Symptom<sup>1</sup>

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## Abstract

Despite the title, the talk is not about Global Warming. It is an examination of what could destroy our civilization and even our species. Human population is no longer regulated by the usual Darwinian processes and we need fear no other species; we can only be destroyed by our own hand. We have so far been unable to control population growth and we are positively addicted to growth in the economy, wealth and consumer products. The talk looks at the end result of all this growth, probably catastrophic, and makes some suggestions on how to reduce its impact.

Despite the title, this paper really isn't about Global Warming. It's about the survival of the human species, and what sort of problems and corrective actions are relevant to its perpetuation. Last time, George Collins<sup>2</sup> described in graphic detail the sorts of problems that will arise from Global Warming and predicted that they would reduce the human population to 2 ½ billion by the end of the century. Now that is a horrific loss of life, but it would hardly qualify us an endangered species.

In medical terms, a symptom is something that may be very distressful, but is not the root cause of a disease or affliction. Doctors know that though it may be necessary to give treatment to relieve a patient's symptoms, they can not cure the patient until they find and treat the root cause of the illness. It is in this sense that Global Warming could be just a symptom of a greater illness afflicting the human species. I shall explain why I think it is.

Almost all discussion of Global Warming and our other problems is in terms of what will happen in the next 10 to 30 years, sometimes in terms of the next century. I want to expand this time scale considerably. The Harvard evolutionary biologist, Richard Lewontin, estimates the average lifetime of a species at ten million years. Humans and their forebears separated from the other apes about six million years ago. So we have another four million years to go just get up to the average. Not many people think about what we should do to fulfill this destiny, but just a little reflection puts a different perspective on matters.

For the past four billion years, the survival or extinction of each and every species has been controlled by the rules laid down by Darwin. Species survival is essentially the statistical end result of the struggles of its individual members to reproduce themselves and escape death long enough to do it. Species were successful when they could fill what biologists call a "niche" in the environment. When the environment changed the species survival depended on at least some of its members successfully adapting through genetic or behavioral changes. If the environment changed too rapidly—and this may include the

introduction of new competing species, predators or parasites—the species could go extinct.

About 50,000 years ago, our ancestors began to escape from this milieu. In the subsequent millennia, the human species has become so dominant, that it doesn't have a mortal fear of any other species, and indeed, other species can only survive if they are able to adapt to humans and their works.

Outside of catastrophic events like mega-volcanoes or huge asteroids, the only thing that can destroy us or our civilization is the human species itself. To quote the famous possum, Pogo, "We have met the enemy and he is us." It would be ironic and perhaps even shameful if, having reached this lofty place in the biosphere, we should squander our heritage.

If, in addition to Global Warming, we look at other environment related problems facing Humanity, they include peak oil, exhaustion of mineral resources and aquifers, overfishing, destruction of forests and other habitats, and the greatest species die-off since the elimination of the dinosaurs by the impact of a massive asteroid. All of these problems arise from the growth of human populations and the growth of our level of consumption, the first largely being a problem of third world countries and the second of first world and newly emerging third world countries. The problem is twofold. First, humanity seems to be addicted to growth and has very little understanding of the nature of compound growth. Second, we are concerned almost entirely with events within our own lifetimes and ignore any thought about the long term survival and welfare of our species. This mindset is entirely natural for individuals who have evolved through natural selection, but they are inappropriate for members of a species that is no longer controlled by its mechanisms.

Way back in 1798, Thomas Malthus<sup>3</sup> pretty well described the situation with the statement "Population, when unchecked, increases in a geometrical ratio. Subsistence increases only in an arithmetic ratio." In today's terms, geometrical ratio means compound or exponential growth and arithmetic ratio means linear growth. He predicted that human misery would be an "absolutely necessary consequence."

Malthus did not foresee, however, the impact of technology and industry and their ability to exploit fossil resources and thus allow subsistence to also increase at something like a geometric ratio, forestalling the onset of the misery. While we worry a little about the population growth, we are positively in love with economic growth and the accompanying growth in our consumption. Growth rates of less than about 4% are considered evidence of economic stagnation. We are now being told that one of the problems with the current economy is that Americans have started saving their money, not spending it.

Almost all talk in the press and in economic papers is in terms of percentage growth per year, and usually the higher the better. It is more instructive to think in terms of doubling time. Compound growth means that if something doubles in 10 years, it will double again

and then again every ten years. After 40 years, it is 16 times larger, and it only takes 70 years to be well over 100 times larger. And guess what; after a hundred years, it's 1,000 times larger and after 200 years it's a million times larger. With this perspective, it is that the growth must stop sooner or later.

The easy connection between annual growth and doubling is the rule of 72. The doubling time is found simply by dividing 72 by the annual rate of growth. An annual rate of growth of 7.2% gives us the ten year doubling time used in the previous example, and the rather shabby 4% doubles every 18 years.

What happens when a population, growing at a compound rate, runs into a constraint that stops its growth? Let's do what we physicists call a gedanken experiment, German for a thought experiment. Assume we put two bugs in a large jar at eight AM and provide lots of food. The bugs double every minute and we assume that the jar is big enough so that it takes until noon to be completely full; the bugs then have a crisis. Now, when do the bugs first sense they are in trouble? Certainly they will by one minute before noon, when the jar is half full; perhaps at two minutes before when it is a quarter full, but probably not at three minutes when it is one eighth full. Also, suppose the bugs are able find another jar, identical to the first. How long will it be before it too is full? One minute. The point of this example is that a population can grow at a compound rate for a long time without problems, but when it runs into a fixed constraint, the end comes very suddenly and there is very little time to make a correction. The bugs have 240 minutes of great prosperity, and in only the last two or three minutes does their world turn into a disaster.

How does this example relate to real life? Most creatures don't live in a jar, but they are subject to strict limits on the resources available to them. We say a population is *sustainable* when the environment can provide indefinitely the food, water, habitat and other necessities of life. There is a second limit, often overlooked, is that imposed by waste product generation. Because waste products are by definition toxic to the creatures that produce them, the generation of wastes can not significantly exceed the rate at which the environment can disperse or neutralize them. Global warming is just such a limit. Although our waste product, carbon dioxide, is not toxic to us at foreseeable levels, it does impact us in the many ways detailed by Dr. Collins.

What happens when a population greatly exceeds its sustainable level? The technical term is "overshoot and collapse." Our principal source of information about this comes from plagues. Most plagues are of micro-organism, algae and insects, and we invariably find them unpleasant. In order to learn something, however, it is necessary to look at it from the other side, from that of the agent that creates the plague. Invariably, plagues occur when an agent is able to exploit a major new resource. This leads to an enormous population increase that eventually exhausts the resource. Lacking the resource, a mass die off follows and the population plummets, often to levels below where they started. In the case of epidemics, when they end, the vast majority of the disease organisms that caused it are also dead; so epidemics are not really good for them either.

There are at least a couple of well documented examples where the plague agent is a mammal. In an area of eastern India, a rare species of bamboo, the Mautam, flowers en-mass every fifty years, dropping millions of protein rich seeds. Rats, with their short gestation period and large litter size are able to exploit this resource and increase their population up to a thousand fold. When the bamboo stops fruiting, the rats begin to starve and so move from the forest to the rice fields, stripping them clean. The result is a famine, both for the rats and the farmers.<sup>4</sup>

Jared Diamond, in his book “Collapse,” documents the destruction of civilization on Easter Island<sup>5</sup>. The story is fairly complicated, but was basically driven by the population growing past the carrying capacity of the island. He states: “In just a few centuries, they wiped out their forest, drove their plants and animals to extinction, and saw their complex society spiral into chaos and cannibalism.” When the forests were gone, they couldn’t build the boats needed to harvest the fish in the surrounding sea. Why didn’t they notice what was happening? Partly it was because there were three kingdoms, which spent all their time and energy competing and squabbling —that’s where all those huge heads came from. They also did not have any historical precedent to guide them. We do.

The parallels with our current situation are clear. The scientific and industrial revolutions have opened up extensive energy and other resources unavailable to previous generations. We have been able to replace muscle power with fossil power and to vastly increase agricultural yields. Simultaneously, we have essentially eliminated predators and competing species, and have largely controlled contagious diseases. All of these factors have allowed the human population to skyrocket at greater than an exponential rate. If other species could speak, they certainly would call us a plague. As I mentioned before, we have had a devastating effect on them, causing the greatest species die-off since that of the dinosaurs. It is in all our interests to avoid the other characteristic of a plague, the massive drop in population that follows the peak; that is the “overshoot and collapse.”

We humans make the bugs in a jar look like, well just bugs. Humans didn’t reach a population of 250 million until 250 AD. We then doubled in 1,250 years, and doubled again in 310 years, reaching one billion in 1810. Then we really got it in gear, doubling in 120 years and again in 44 years<sup>6</sup>. The greatest population growth in history came in the 1990s and the World Population Clock now stands at nearly 6.8 billion. It’s inconceivable that we can sustain the current rate of growth; in less than a century, the population would be at 30 billion. So the question is: where is the limit on human population and can we find the means to stay within it.

The maritime term “carrying capacity” has been adapted to be the measure of the population size of a species that can be indefinitely sustained by the environment. It is dependant on a large number of factors such as food and water supply, sunlight, nesting space, predators and competing species. Populations normally grow when they are below the carrying capacity and shrink when they are above it.

For humans, carrying capacity is even more complicated than for other species. Technological innovations, especially in agriculture and public health, have a major

impact. For example, the Green Revolution in India resulted in a 30% increase in the crop yield per acre in just 32 years. But, there are limits to this sort of thing, of course, and most studies have looked hopefully at limiting the World's population at something like eleven billion people. The implication is that this is within the World's carrying capacity, but that maybe just wishful thinking.

Probably the biggest factor in determining the carrying capacity is the expected standard of living. Currently, the one billion people (14.7%) in high income countries consume 80.6% of the resources in dollar terms. We in the U.S., with just 4.6% percent of the population, consume 33% of the world's resources. The picture is more complex if you look at consumption in terms of kilos of meat, fish or fuel, but the overall picture is the same. For First World standards, the carrying capacity of the world is something under two billion people.

Much of the rest of the rest of the world, including China and India which have a combined population of 2.5 billion, has aspirations to live like we do. The numbers only begin to add up if we greatly reduce our consumption of resources.

It behooves us to think a little bit about the possible scenarios for how the end of our population and consumption explosion will play out. The most optimistic, and thus the most popular, is that we will somehow stop our population growth and technology will rescue us from a subsistence existence. Everything you hear about green technology, solar power, hydrogen powered vehicles, and on and on is premised of the validity of this scenario. I, like every other person, hopes that it is so.

I can think of three other scenarios, but they are much less rosy. I will call them: managed disaster, all out conflict and rule by warlords and thugs. Some combination of these will result from any significant reduction in the world's carrying capacity. The third is probably the most likely as we have already seen numerous examples of it in impoverished third world countries.

There are at least two ways in which the carrying capacity may be reduced. The first is simple resource exhaustion, which has been discussed extensively in the literature and the press. Examples include peak oil, drainage of aquifers, loss of topsoil and the end of easily recovered minerals. But, what tends to be missing from most accounts, are systems studies about how each of these problems impacts the others. For example, can we really replace petroleum with renewable energy, given that alternative sources like wind farms require major amounts of steel, copper and other non-renewable resources. Given that we currently, and have always, used the cheapest and most easily recovered resources, the effects of their simultaneous exhaustion could be much more severe than the loss of a single one.

George Collins detailed how Global Warming will cause a drastic drop in the world's carrying capacity. He pointed out that water shortages will become critical because of desertification, the ongoing exhaustion of our aquifers and the loss of the glaciers that feed many of the world's great rivers. Combined with the expected rise of the ocean

levels flooding much of our crop land, it is clear that food production will be severely impacted. He estimates that these and other impacts will reduce the human population to about 2 ½ billion by the end of the century.

A number of people have compared our situation to that of the algae in Lake Erie that bloom because of our fertilizer runoff, but then go through overshoot and collapse. They ask: “are we really any smarter than those algae?” Unless we take action, the answer has to be NO!

Therefore, I do not bring up these dire consequences just to scare your pants off. Rather, I think that any preparation that we do now can have very significant benefits. But, as it is very difficult for people to make and implement plans that have goals that fall short of where they presently are, it is important to understand that the failure to do so will leave us, like the algae, much worse off.

I can not say exactly what we need to do to prepare for the future, but a few thoughts may be in order. All of the alternative energy and green initiatives should be supported because we have much to learn from them. Many of them will turn out to be impractical, but some may prove to be our salvation. We need to find out which are which while there is still time to build a new infrastructure.

We have much to learn from people like the Amish. Amish farmers do very well on 50-100 acres of land, and consume very little petroleum and other vanishing resources. They can till their farms with one or two horses for ten years at a cost of only a few thousand dollars. Try pricing out the cost of a tractor, its accessories and fuel for that period of time. There are also a number of low-tech innovations in third world countries that could be turned into Green solutions here. It gets very cold in Manchuria, but we saw the Chinese growing fresh vegetables all winter long in greenhouses that have no heaters. They are built like a lean-to against an eight foot high earthen wall. It is made just out of polyethylene sheeting, but the farmers place large rolls of straw on the top of the wall which they roll down over the plastic at night to keep the heat in, and roll up in the morning to let the sun in.

We can be very proud of Cleveland. We have a very active program to develop a creating a green and sustainable economy for Cleveland by the year 2019, the 50th anniversary of the famous Cuyahoga River fire. Here, sustainable is defined as meaning “development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” This effort has been under way for several years by a large number of Northern Ohio organizations and individuals.

This August, a major step forward in the planning was made at a three day Appreciative Inquiry Summit, entitled “Sustainable Cleveland 2019 – Building an Economic Engine to Empower a Green City on a Blue Lake,” which was attended by over 700 people. The Summit was organized by Mayor Frank Jackson and Dr. David Cooperrider of the CWRU Weatherhead School of Management and the Fowler Center for Sustainable Value. Along with about fifteen others, it was funded by The Cleveland Foundation, the

George Gund Foundation, the Generation Foundation, Surdna Foundation and the City of Cleveland.

You might be wondering what an “Appreciative Inquiry Summit” is. Rather than having the usual cast of expert and political speakers, it uses a process developed by Dr. Cooperrider to draw out the ideas and desires of all the participants. It builds on strengths and opportunities, rather than problems and thereby encourages innovation and commitment to a collectively generated plan. It has been used by the United Nations, the U.S. Navy, the Dalai Lama and a variety of global forums. Of course, there were also a number of talks, but to provide background information, not to direct the proceedings.

Since the Summit, the Mayor has appointed a “Chief of Sustainability,” the first cabinet level position of its kind. Also, the “Sustainable Cleveland 2019 Council” has been formed to coordinate the implementation of the many projects resulting from the summit.

As far as I know, Cleveland is unique; there is no other city that has embarked on such a program.

In America, we are fortunate to live in one of the last continents to have significant development—Lewis and Clark embarked on their expedition to the west of the Mississippi only 200 year ago—and we have not yet filled it to anywhere near capacity. Therefore we are in a better position to survive than most and it is tempting to be smug about our future. But we live in a global economy where much of what sustains us comes from other, much more crowded, lands.

Humans do not “go gentle into that good night<sup>7</sup>” and we can expect all sorts of turmoil as populations struggle to survive. Given that we have already felt compelled to build a fence across our southwestern border to keep out those less fortunate than ourselves, can you imagine what it will be like when things get really tough? Wars and genocide, conducted in order to grab a larger share of the dwindling resources can not be ruled out. With nuclear weapons and other advanced technologies, these could reach horrific dimensions.

Therefore it is imperative that we initiate a dialog with other nations to minimize everyone’s pain and reach something of a fair and just plan of action. The work being done to mitigate global warming is a good start, but it will fail if all the other factors are not taken into account.

In summary, I have tried to point out that uncontrolled growth, both of population and of consumption, is the ultimate problem. If we take the usual route of planning just for us and our children, then we can easily get bogged down in debates about the severity of our current problems, and consequently end up doing nothing. If, however, we remember that we are the beneficiaries of a six million year old heritage, which we have an obligation to carry forth, then it is obvious that it is merely a matter of time before the problems that we see looming, become real. Global Warming is here, so the time is now. Just don’t forget all those other things.

## REFERENCES

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<sup>1</sup> This title was taken from a discussion topic on IRASnet, an Internet discussion group of the Institute on Religion in an Age of Science, [www.iras.org](http://www.iras.org).

<sup>2</sup> Collins, George W. *What Is New About Global Warming?*, Philosophical Club of Cleveland, (Nov 10, 2009)

<sup>3</sup> Malthus, Thomas, *Essay on Population* (1798).

<sup>4</sup> Foster, Peter, *Indian farmers braced for rat plague*, The Telegraph (May 4, 2007)

<sup>5</sup> Diamond Jared, *Collapse, How Societies Choose to Fail or Succeed*. New York: Viking Books (2005)  
*Easter Island's End*, Discover Magazine (August 1995)

<sup>6</sup> Vaughn's Summaries (One-Pagers), <http://www.vaughns-1-pagers.com>

<sup>7</sup> Dylan Thomas, *Do Not Go Gentle Into that Good Night*